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How Will AI And Robotics Transform the Traditional Roles and Mandates of Teachers and Students?

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ABSTRACT

This paper seeks to provide an overview of research usage of Artificial Intelligence and robotics in education and how it affects students and teachers. Out of 48 originally identified sources of information including research papers, websites and government studies 25 were included in the final synthesis of the paper. This paper entails of the advantages, disadvantages of AI for teachers and students by providing multiple point-of-views and citing official studies and statistics. A search on scholar.google.com[1] 45,50,000 sources of information and a search on dl.acm.org[2] led to 202,000 results. To filter the multiple sources I took papers with information on the present of the predicted future or with information regarding teachers and students only and no external effects. After multiple such filters I cited approximately 20 to 25 sources.

Keywords : Higher Education, Artificial Intelligence and Robotics

I. INTRODUCTION

Artificial intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. Some of the applications of AI include expert systems, speech recognition, and machine vision. Robotics on the other hand refer to the engineering and operation of machines that can autonomously or semi-autonomously perform physical tasks on behalf of a human.[3] Robotics are now widely used in manufacturing of products, healthcare and home-cleaning.

As a student myself, I have noticed the rapid technological developments and proliferation of artificial intelligence and robotics over the years in the education techniques and resources. In my school study platform we have a virtual artificial intelligence assistant which helps students by reminding them of their daily assignments, preparing for their tests, and more. This AI assistant has helped me save a lot of time and ace my exams. Students as well as teachers are therefore increasingly embracing AI and robotics into their daily education process.

The potential of AI and robots to reshape our future has attracted a great deal of public, government, and academic interest in recent years. Higher education (HE), like all other areas of life, will likely be impacted by these technologies [4]. Higher Education denotes that people will have to adapt to train them to work in the new economy and possibly a different way of life roles, transforming how the university

functions as an institution. Computers have been used in teaching industry for over 20 years. Computer Based Training (CBT) and Computer Aided Instruction (CAI) were the first systems used to try to teach computers. [5]Both CBT and CAI are fairly effective at supporting learners, but they cannot provide the same personalized attention that students receive from human tutors. For a computer-based educational system to provide such attention, it needs to think about domains and learners. This has stimulated research in the area of Intelligent Tutoring Systems (ITS). ITS offers a great deal of flexibility in presenting materials and a great ability to meet the needs of individual students. These systems achieve their "intelligence" by presenting both pedagogical decisions about teaching and information about learners. This increases versatility by changing the way the system interacts with students.[6]

The main aim of this paper is to give readers a new perspective the benefits and drawbacks of AI and robotics to the education industry. There is the present and future uses of AI and robotics by both the teachers and students.

II. Method

This is a literature review paper which entails researching different resources based on topic given, researching these different resources will help me note down facts for my final paper. I have traced different resources from various sources including scientific papers, websites, and YouTube videos as references to complete this task. I will be synthesizing the different sources to offer a broad view of what is projected to happen in AI for higher education including in relationship to teachers and student roles. The research method will also include a personal reflection part based on my first-hand experience of being a student in India and how I think AI and robotics could be used in India to benefit the students and teachers. I accessed Google Scholar[1] and search for research papers with many different terms such as 'AI and teacher', 'Advantages of AI in Education' and 'Upcoming developments of AI in education'. After searching for such terms I found multiple papers with interesting information which I collected and made a note of. After collecting data from multiple papers I sorted the information into sections and organized them accordingly.

III. Teachers, AI, and Robotics

3.1. Current Applications

Teachers across the world use AI technology with ITS (Intelligent Tutoring System). One-on-one tutoring can be simulated with intelligent tutoring system (ITS). Based on learning models, algorithms, and neural networks, it determines an individual student's learning paths and content choices, provides cognitive scaffolding, and engages students in conversations. ITS has great potential, especially in a large distance learning institution that operates modules with thousands of students where a human cannot give her one-on-one attention[7]

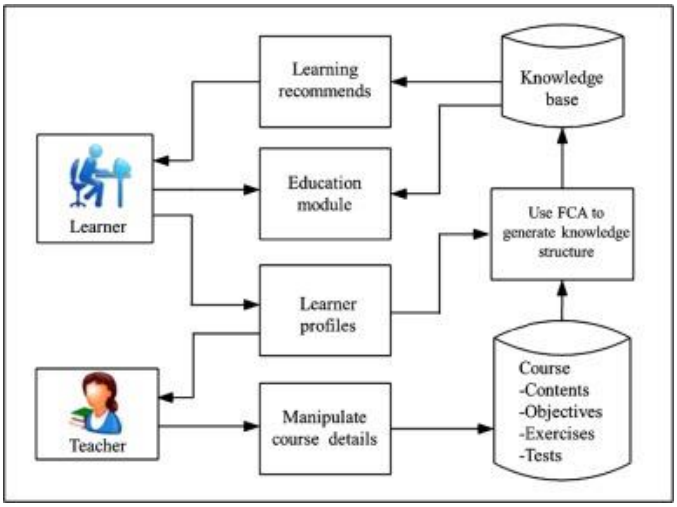

Figure 1 : ITS (Intelligent Tutoring System) [6]

3.2. Possible Developments

Many teachers in universities or high schools may use the concept of the smart campus by bringing in AI in multiple sections of the school/campus. It is a notion developed by Nasro Min-Allah and Saleh Alrashed[8]. Smart campus refers to a constellation where

technology and physical infrastructure will merge to provide better services to students and easement for the teachers. A smart campus utilizes and integrates AI technology and robotics to establish responsive, intelligent, and improved services. They also help by creating a productive and sustainable environment for the students to study in. The teachers can use the smart campus idea for the betterment by using the following features as shown in figure 2.

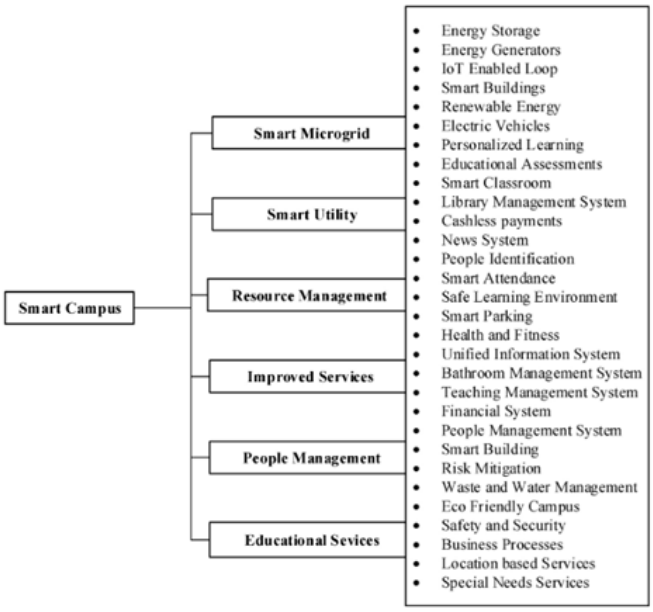

Figure 2 : Smart Campus [8]

AIDan, Teaching Assistant: AIDan uses "(ITS)".[9] This is an adaptive teaching method that is tailored to each student's abilities and strengths. This raises student interest by learning in a comfortable way, including: B. Video or hands-on activity. One of the advantages of this system is that students are more productive because they want to learn with interest. ITS can also use AR and VR to make the experience more immersive. Another software used is (AWE) auto-write rating. This helps to evaluate the student's writing and also helps to improve it. Inventions such as AIDan help teachers reduce their efforts. If this continues overtime teachers may become redundant and lose their jobs.

Possible development in the field are shown in many papers such as Baker and Smith's paper in 2019 [10] where the system of Intelligent tutoring systems (ITS) helps teach course content step by step, taking an approach personalised to the individual.[11]

As years pass teachers can no longer depend on their prior knowledge to teach the entire syllabus which is renewed quite often. By the use of AI teachers will have all the information and knowledge they need at hand. By this teacher will easily be able to upgrade themselves and also teach their students more.

3.3. Promising Advantages

Few AI assistants decrease the amount of work teachers do, for example few AI based on NLP algorithms have the ability to assess a students work by understanding the meaning of the students essay and then moderating it and giving it a letter or number grade with accuracy and precision[12]. This will reduce the amount of time teachers spend on corrections and also give them more time to prepare for other lectures or tests. By saving time the teachers will be able to make more intensive lectures because of which will help the students as well. With more meticulous assignments and lectures the student will have to work harder and therefore understand better.

AI helps people with disabilities learn and understand concepts in a more accessible way. Programs built specifically for this purpose have already been tested, such as "Affectiva's Affdex"[13]. It detects emotional reactions from facial expressions when people are watching a video or animation, and can change the pace depending on how fast things are going, or use other things like lighting effects. This is useful when teaching those students who have difficulty understanding material presented at conventional speeds due to impairments related to visual processing speed, working memory capacity, attentional control, etc. The average student will do in a lecture/course unless it is explained more slowly than usual or there is extra time between questions and answers to influence others around them.

AI is being used to automate tasks in various

industries and can also help in education. Professors and teachers typically have to manage the classroom environment in addition to numerous organizational and administrative tasks. Teachers don't just teach, according to the Research Paper Writing Services report. They also spend time grading tests, grading homework, submitting required documents, writing progress reports, organizing resources and materials for lectures, and managing teaching materials. They end up spending so much time on non-teaching tasks that they become overwhelmed. Artificial intelligence automates these tasks, allowing you to spend more time on core educational tasks instead of dealing with administrative tasks making the teachers work more efficient.

3.4. Possible Disadvantages

One of the ethical dilemmas that can be identified is the problem of unemployment. By the increasing use of AI and Robotics teachers will be made redundant. This redundancy will lead to the teachers becoming stressed of finding work or earning money for their basic needs. This may also affect the entire economy as the employment rate and GDP of the entire country will fail.

From low-skilled, repetitive tasks that require little reason to perform them to more complex tasks that require surgical precision to perform them, they are more than you have. The teachers will be replaced by an economically "efficient" machine or AI technology which reduces costs. He reinvented himself and learned other more specific deals so he could sell his workforce and survive in a world where he needed money to maintain a comfortable lifestyle.[14] An example of this could be the usage of online study platform such as Coursera or EDX. They have courses from the top universities such as Harvard, Massachusetts Institute of Technology, Berkeley and more for free or low prices. These low/free prices allow students who are underprivileged to get the teaching services without the need for teachers.

IV. AI with Students

4.1. Current Applications

Currently students use AI such as Alexa or other virtual AI assistants to remind them to do their homework or assignments. By giving them voice commands students can get reminders, alerts or instructions. This helps students to avoid missing to miss deadlines or having many tasks unfinished.

The “inverse class model” refers to reversing the traditional division of schoolwork and homework. With the ubiquity of Internet technology, students can use high-quality educational resources already available online, as well as teaching materials specially created by teachers, to help them understand basic concepts.[15]

Computer-aided instruction has been used for many years, bringing the power of computers to work in the educational process. The original CAI programs essentially mimicked previously existing teaching materials. For example, a popular CAI technique reflects a method known as programmed instruction. In a programmed instruction text, students read a brief instruction manual and are then presented with short questions to test their understanding. [16] Students use these methods to ace their exams. Some students can even use these methods to increase their interest levels for the subject or topic.

Students in higher education can use Chatbot as a study tool to help them. A chatbot is an artificial intelligence (AI) automated software tool that simulates a conversational interaction ‘between the user and a computer, using natural language[17]. Where chatbot technology is enabled, the end user is able to ‘talk’ to a pre-built AI chatting robot, rather than a human individual[18].

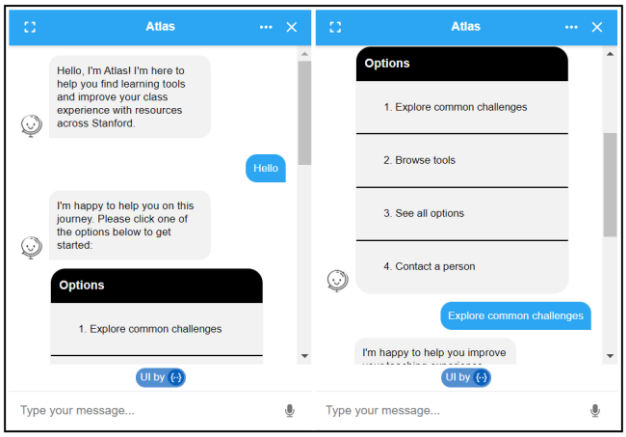

Figure 3 : Chatbot In Education [19]

There are few AI Inventions that help students learn individual topics. For example, the iTalk2Learn AI system. Designed to help young students learn fractions, the iTalk2Learn system16 builds a learning model that includes information about the learner's math knowledge, cognitive needs, emotional state, feedback received, and reactions to that feedback. [20]

A model-based adaptive tutor can include various AIEDs tools[21] such as:

- Change the cognitive and emotional states of learners.
- Use dialogue to engage students in learning experiences including Socratic Learning Experiences, Discussions, and QnA.
- Involve an open learning model that encourages reflection and self-awareness.
- Use metacognitive frameworks to increase learner motivation and engagement
- Use a social simulation model. For example, language learners' understanding of cultural and social norms can help them connect more effectively with speakers of their target language.

4.2. Upcoming Developments of AI and Robotics for Students

There are many futuristic and anticipatory AI technology designs, but those ideas are inspired by the teacher's bot description by Bayne [22]. This bot is called a "CriticalBot".[9] This bot does not work as a human. Bots are pretty clumsy, but this benefits students. When a student asks for help, it suggests a treatise or essay to read, and if the student wants a summary, the bot tells them which part of the paper or book the student gives the summary. These include a summary of the research treatise or the last page of the book. This is an example of a conversation between a Critical Bot and a student: -

Student 1: @CriticalBot we have been set the task to research bias in AIED. What do you know about bias in AIED?
Critical Bot: Blanchard is recommended in the reading list.
Student 2: I think he means rtfm.
Student 1: Blanchard?
CriticalBot: Sorry. I should have typed: Blanchard, E. G. (2015). Socio-cultural imbalances in AIED research: Investigations, implications and opportunities. International Journal of Artificial Intelligence in Education, 25(2), 204–228. No one's perfect.
Student 1: @CriticalBot What is the main point he makes?
CriticalBot: Nice try. Try reading the abstract. Abstracts summarize key points. It may also be useful to read the conclusion section to grasp the author's main argument before deciding on whether to undertake a closer reading. [9]

4.3. Advantages for Students of using AI and Robotics

Using AI or Robotics will allow students to better understand difficult topics or segments of their portion as the AI will modify the study material according to the student. For example, if a student understands better with videos, then the AI will find suitable videos with the best explanation about the topic and show it to the student. Students can use

chatbots to help them. Chatbot is an AI bot where a student talks to the software bot which helps the student get resources, information or instructions regarding his/her studies. This will not only help students save time by making it easy for them to complete assignments it will also help them understand the content logically instead of mere memorization.

Another useful AI software for students is Computer-Aided Instructions (CAI). Computer-Aided Instructions is a way for students to effectively go through their portion easily and also understand all the concepts. Using such CAI methods will allow students to improve their grades and even help students remember the material better[16]. Every student has a different time of preference to study. Some like to study early morning while some study late at night, so with AI bots' students will be able to get help on their topics anytime they want. If a student is studying at a time without his teachers being around, the student can use the AI bot to find solutions to his/her doubts and also fix the confusions.

Students can use AI enthused VR Technology to experience hands on activity in the same place without having to get different equipment and resources. If there is a shortage of some resources the school can buy VR headsets for the students. Inspired by aviation education, VR-enhanced learning enables teaching support in authentic environments and pushes the boundaries of the classroom. A realistic immersion in a virtual environment helps learners understand the material better. It also serves as a stepping stone to a real-world experience with fully integrated AI, where humans can become machines for space and ocean exploration, fraud detection, knowledge management, professional training, and precision surgery.

4.4. Disadvantages for Students of using AI and Robotics

Many times, AI has a negative effect on students instead of helping them. Some uses of AI make the students lazy and less prone to work harder on their assignments or self-studies. If a virtual interface helps students by providing information and data students will just use the AI to do the entire work and will in turn not learn anything. The use of robots and artificial intelligence tools can lead to an emotional disconnect, with students and teachers saying robots have no emotions and cannot imitate them. Without the emotional connection a student has with his teacher a student may or may not find his true interest in a subject or something he is really excited by. This could going further lower a student in education altogether.

Artificial intelligence in education faces many financial challenges. Artificial intelligence is being developed by well-trained scientists who have spent years working to perfect the technology, requiring funding to continue research and paying collaborators to collaborate on projects. Although artificial intelligence brings some advantages to education, it also has its drawbacks. One of the major drawbacks of artificial intelligence in education is the economic issue. Purchasing hardware and software that can support AI capabilities such as facial recognition and natural language processing tools is expensive, making it difficult for resource-constrained school systems to implement these technologies in the classroom. As students or few schools may not be able to afford the AI or robotics, some students may have an advantage against the other students.

V. Projected Use of AI and Robotics in Indian education

5.1. Use of AI in India Compared to the Rest of the World

Table 1

Country	Lead Author Country of

	Afflilitation
USA	9
UK	6
China	4
Germany	2
Australia	2
Saudi Arabia	1
Peru	1
Greece	1
Netherlands	1

After going through multiple papers and making a tally of the places where the research was carried out, I then counted the tally and made this table with the numbers. As illustrated in table 1, India does not have any affiliation with research going on in the AI and education field. Countries such as USA and UK are highly focused on the uses of AI in education. This impacts the quality of education in these countries as well, so for a better education students for India want to go to other countries where there are more resources available for their education. Schools around the world are incorporating AI into their teaching methods. Especially in China, although it is not yet a global market leader in the field of artificial intelligence and robotics, it has great potential for the future market of artificial intelligence technology due to its growing enthusiasm for research and development. Intelligence in education and its associated benefits outweigh many current concerns. With the reform of the Chinese curriculum, many high-tech teaching methods have been introduced into schools. Increasingly weak artificial intelligence is being introduced into school lessons. Whereas in India AI is not available in abundance. This lowers the easement by which students in India can study with maximum results and efficiency. In turn the Indian Syllabus is very rigorous and intensive which causes many Indian students to drop out before completing their education. According to a survey conducted by the National Statistical Office (NSO) of the Indian government, one out of every eight students enrolled in a school or college drops out before completing their education[23]. If this continues India's literacy rate would lower and it would in turn cause Indian students to be less motivated to study.

Globally usage of AI in education is increasing by 45% per annum. By this rate there will be $5.8 Billion.[24] Another use of AI across the world is that technology or programs developed in one country can be used in another country as well. This will allow students from a country where education is not developed a lot to experience higher and more formal level of education. Through AI tools, we can make the classroom accessible to every student in the world. This includes students who are deaf or visually impaired, as well as students who speak different languages. Her PowerPoint plugin like Presentation Translator allows students to caption everything a teacher says in real time. This opens up new opportunities for students who need to study at different levels, want to study subjects that are not available in school, or are absent from school due to illness. AI can break down the silos between traditional grade levels and schools.

5.2. Future of AI and Robotics in Indian Education

Currently, AI is not widely used in India but with new upcoming projects and inventions the use of AI in India will spread fast and help the high population of student. As the average Indian household income is very low, getting expensive AI technology and robotics will now be possible for the students. A lot of the technology will be bought by the schools or government and set up inside school campus.

Artificial intelligence has great potential in India for development. AI technology in India has the potential to become a world leader in this field. In India, AI technology is being used effectively in almost every industry, including healthcare. As such, AI has gained great importance in the Indian education sector as well. According to NITI Aayog's expectation by 2035 Ain could end up increasing India's economic value by 1 Trillion USD[25]. According to the report, India has the ability to "overcome the physical limits of all its resources, unlocking new sources of value and growth." In India, AI technology can automate both complex operations such as checking multiple essays and routine operations such as reminders for tests and assignments. This will allow India to make better use of their human resources, allowing them to focus their efforts where they add the most value and increase their overall efficiency. The use of AI in the development of fields such as agriculture, healthcare, and education can lead to an entirely different level of innovation.

Dr. Prasant Mohapatra recently spoke at the 'Galaxy of stars event' about AI and Indian education. In his discussion, Mohapatra focused on how human intellect and artificial intelligence may merge in the future. He counselled the students and other educators to pay more attention to the theoretical underpinnings of artificial intelligence and less to the uses that it may be put to. He claimed that it is crucial for pupils to comprehend the drawbacks of AI and distinguish between the good and the bad parts of AI. Galaxy of Stars is a promising initiative that aims to develop in the kids of SAI International a scientific mindset, curiosity, and critical thinking. It serves as a hub for the exchange of research and space expertise. It will serve as a platform for education on the planets, constellations, and cosmos. To foster a culture of scientific inquiry and creativity among the pupils, this centre will plan a variety of educational events.

If the Indian education system integrates AI and robotics into its education system, all shareholders of the industry could benefit.

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